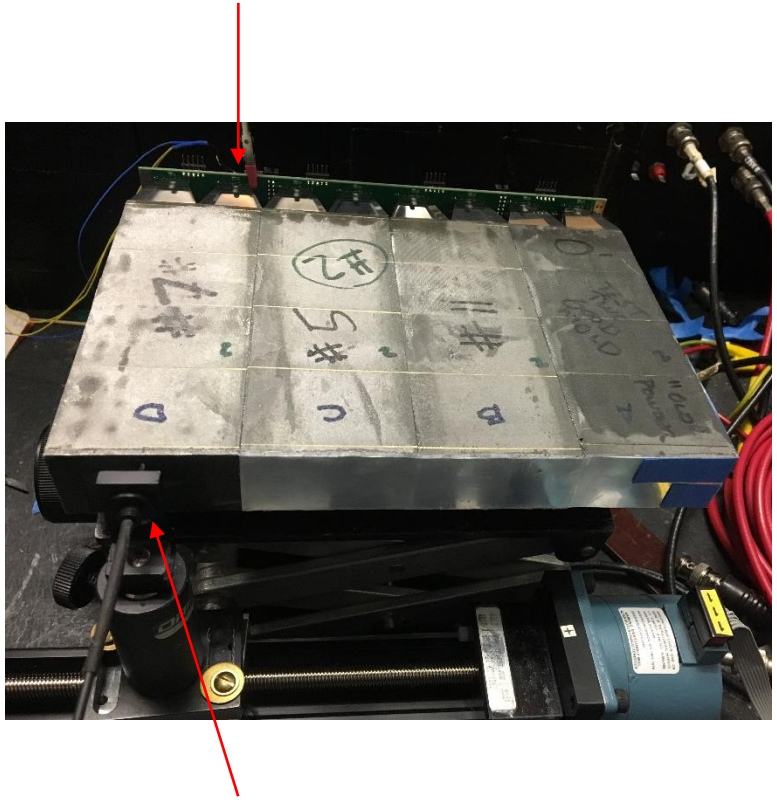
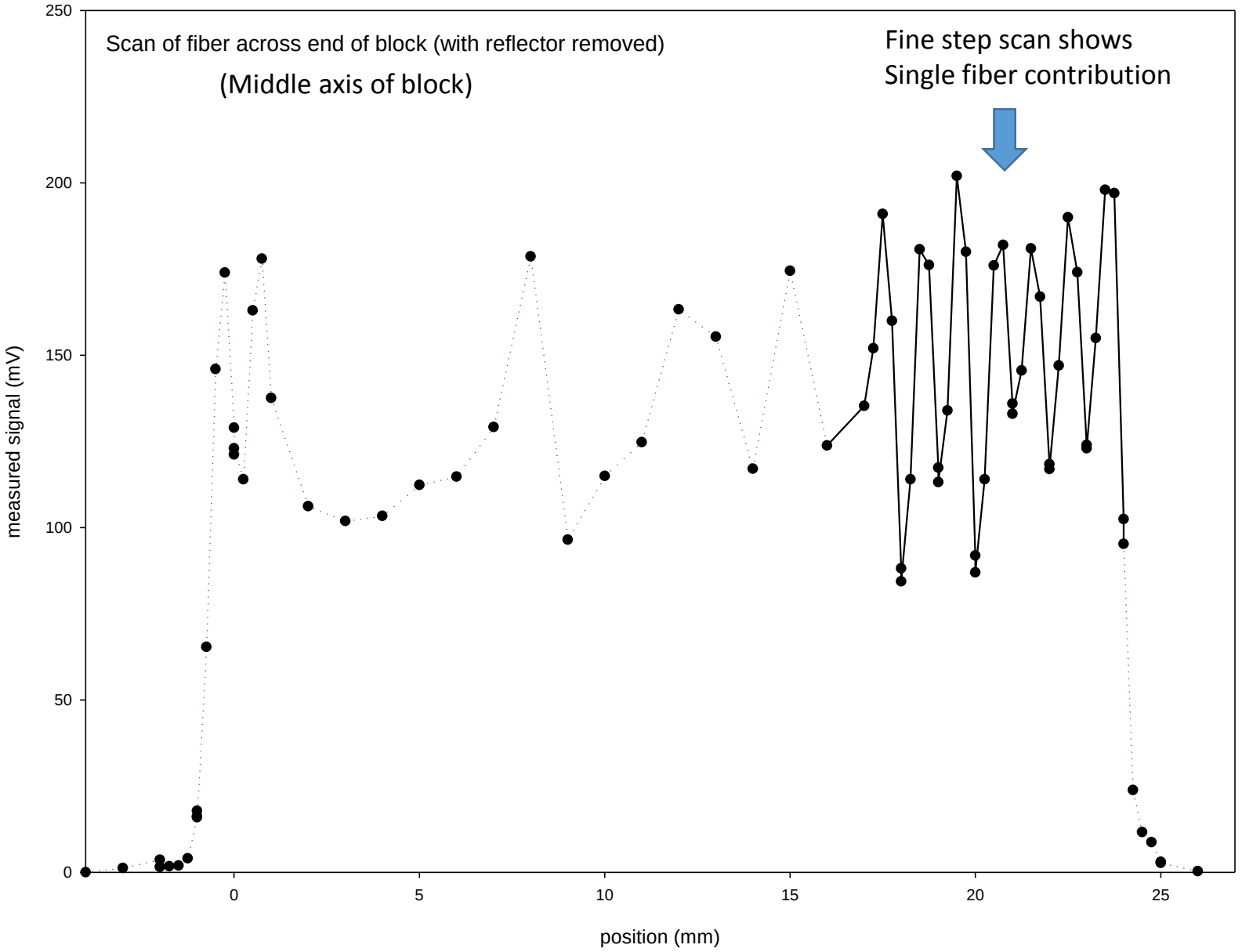
Light Distribution / Response mapping of EMCal Block and light guides

(Updated) 8/2/16

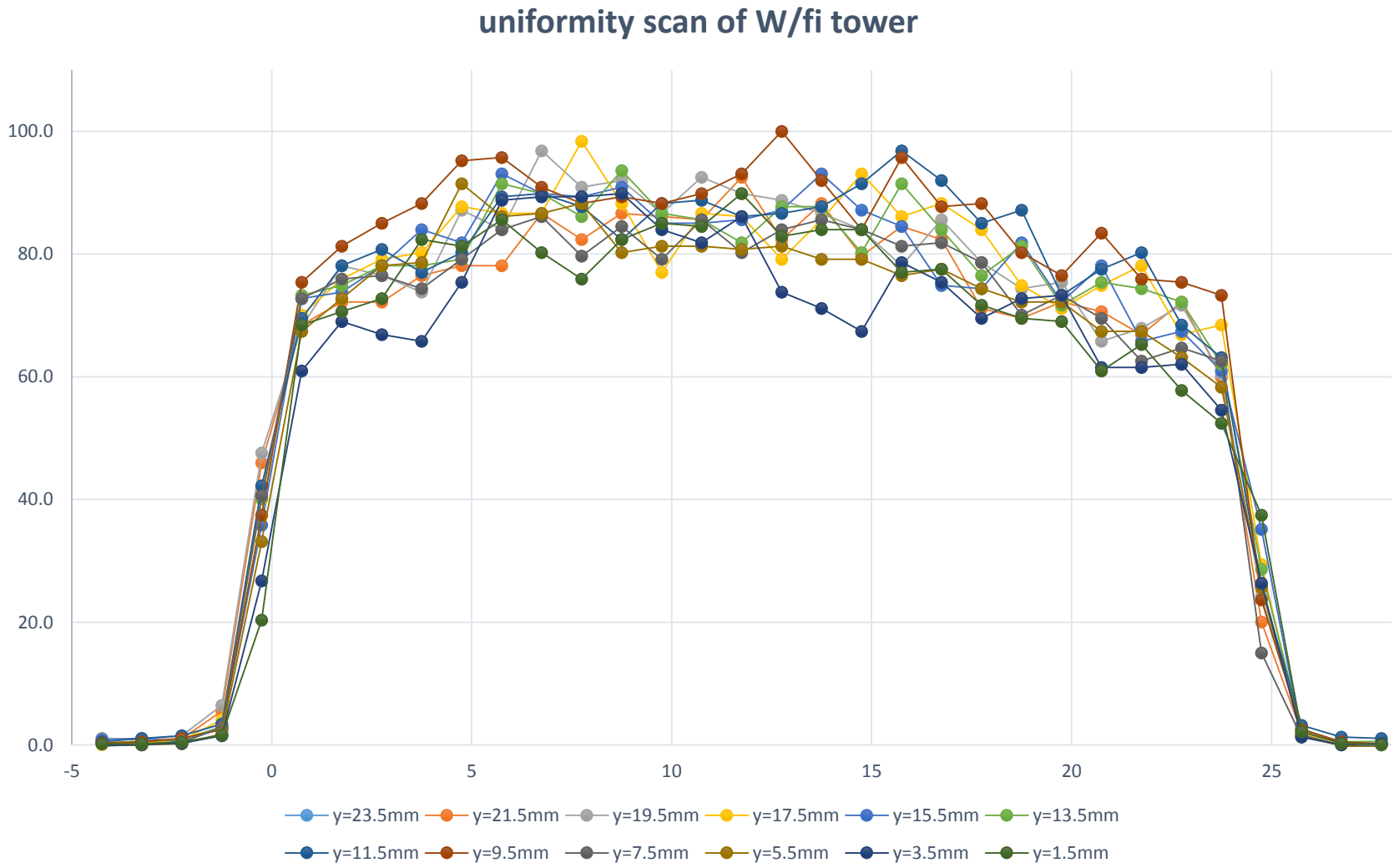
Measured signal is summed output of 4 sipms on this tower

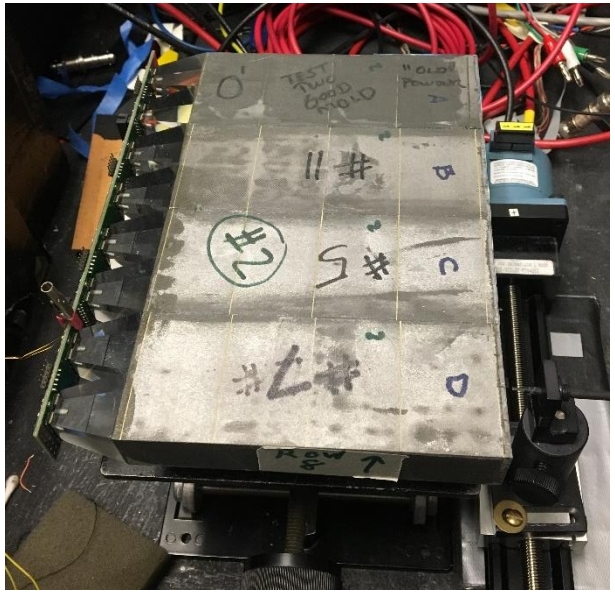


362nm LED into 1mm diam fiber scans across open end of tower
Fiber ~ 0.5mm from block face

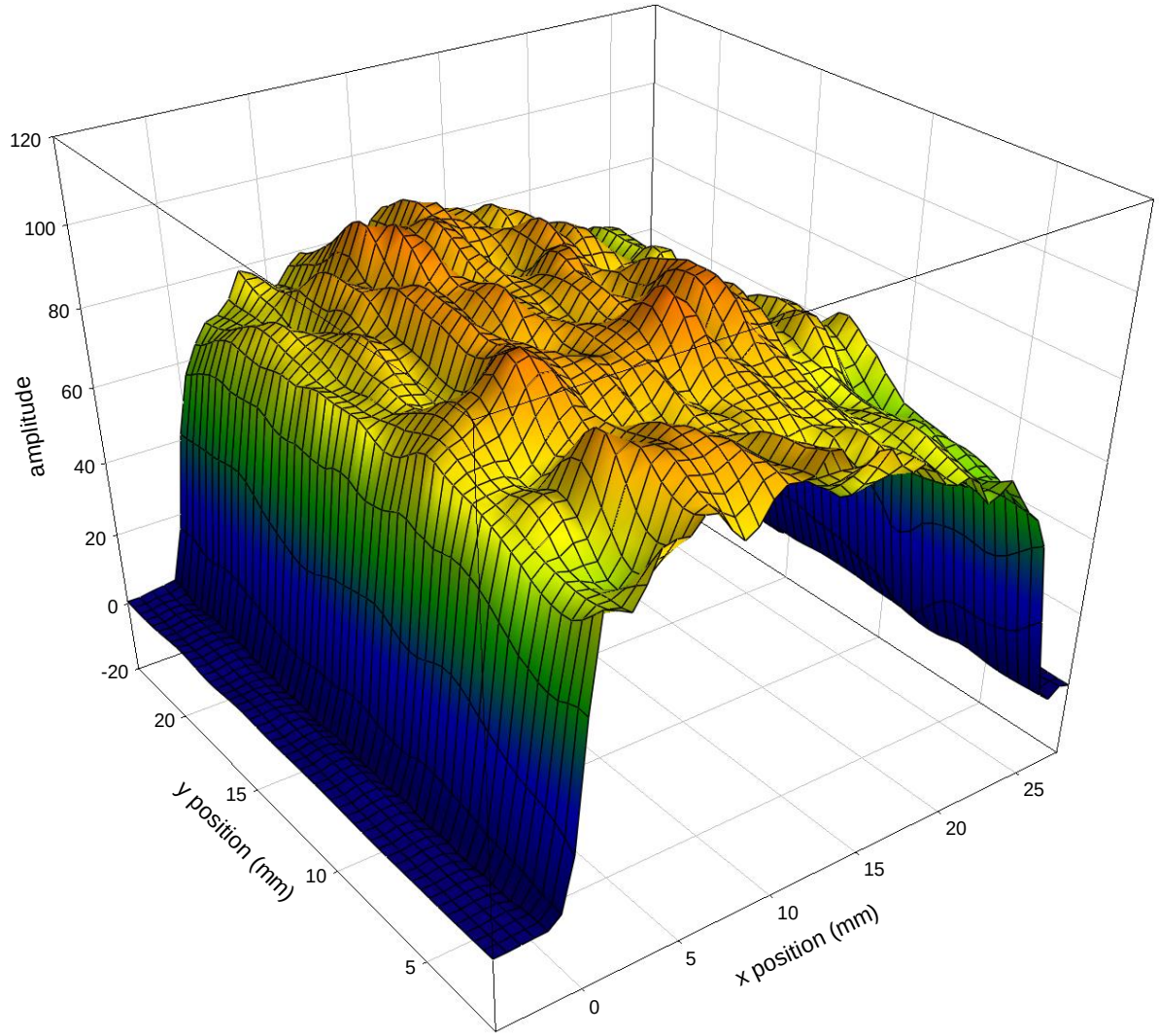


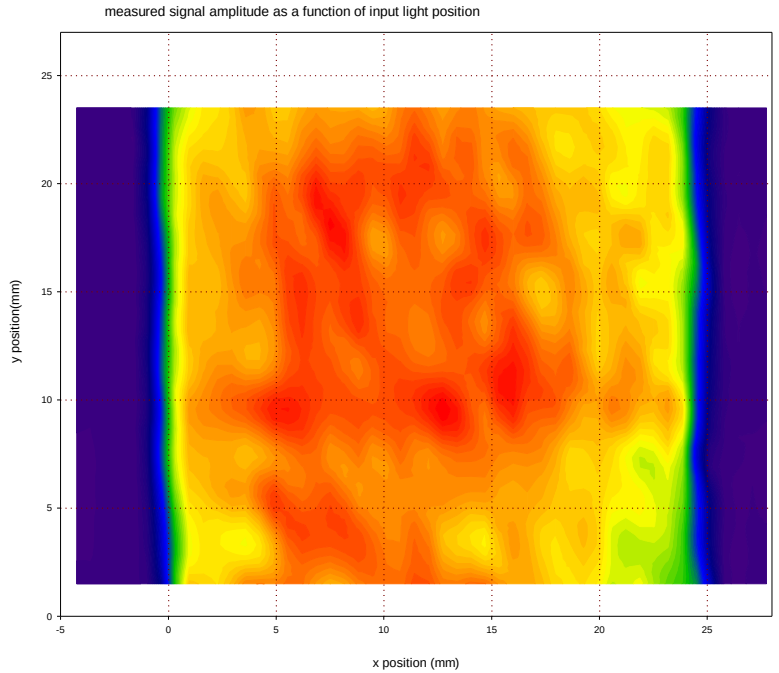
Scans across X dim
At different Y values



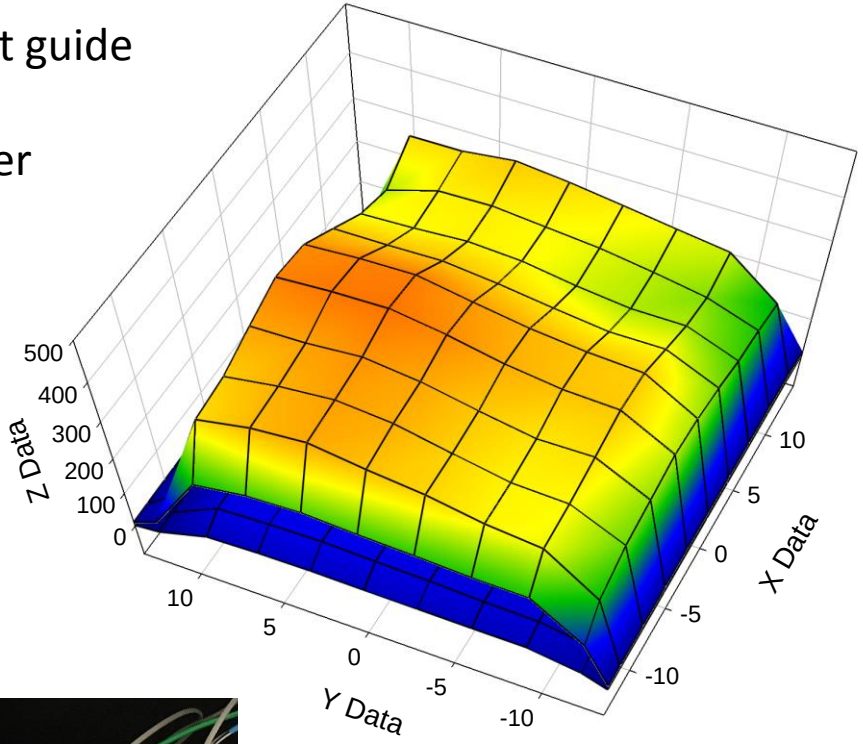


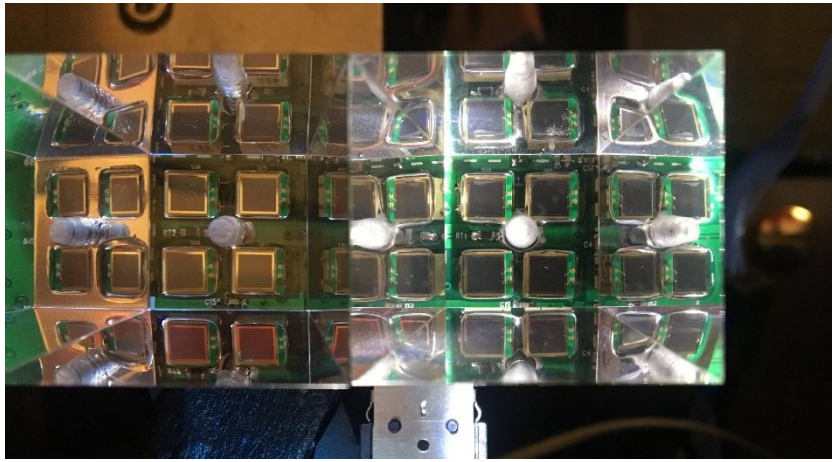
Data from slide 3 plotted as 3D surface

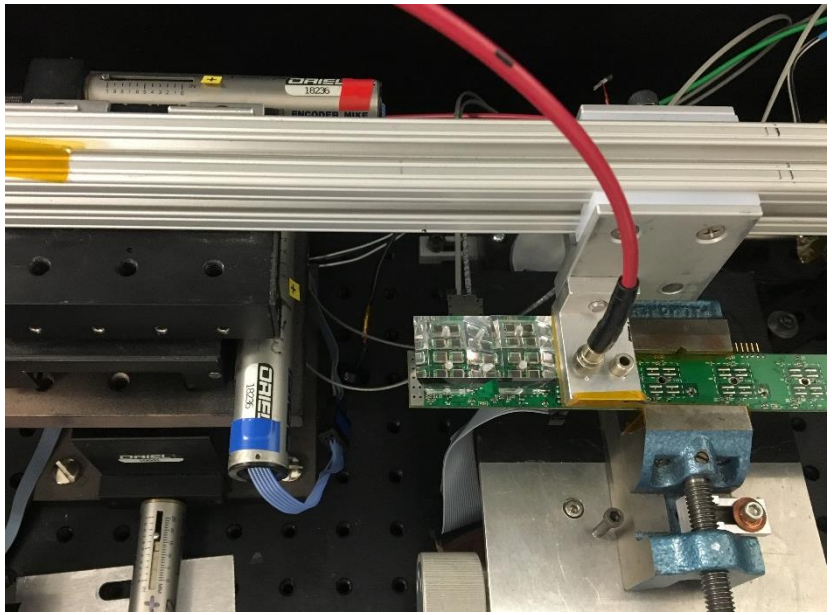


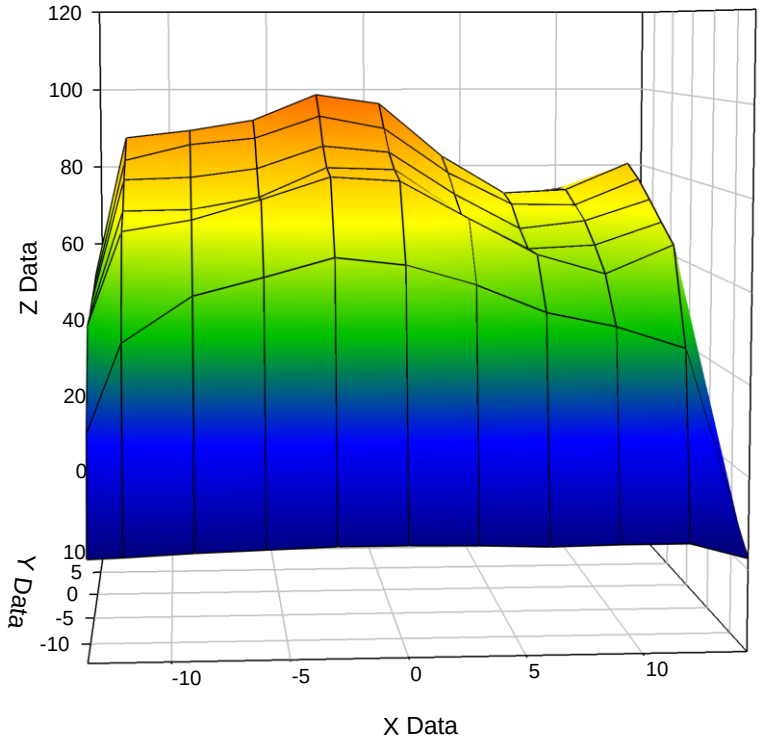


Response map of tower 1 light guide
(light guide only – no block)
420nm LED / 0.6mm diam fiber
Fiber ~2mm from LG surface

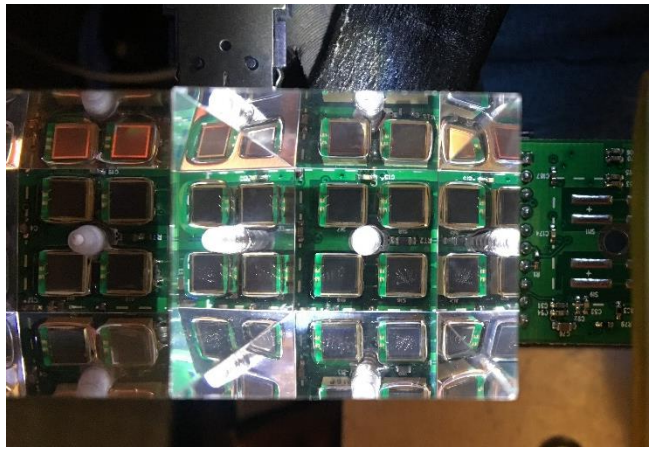


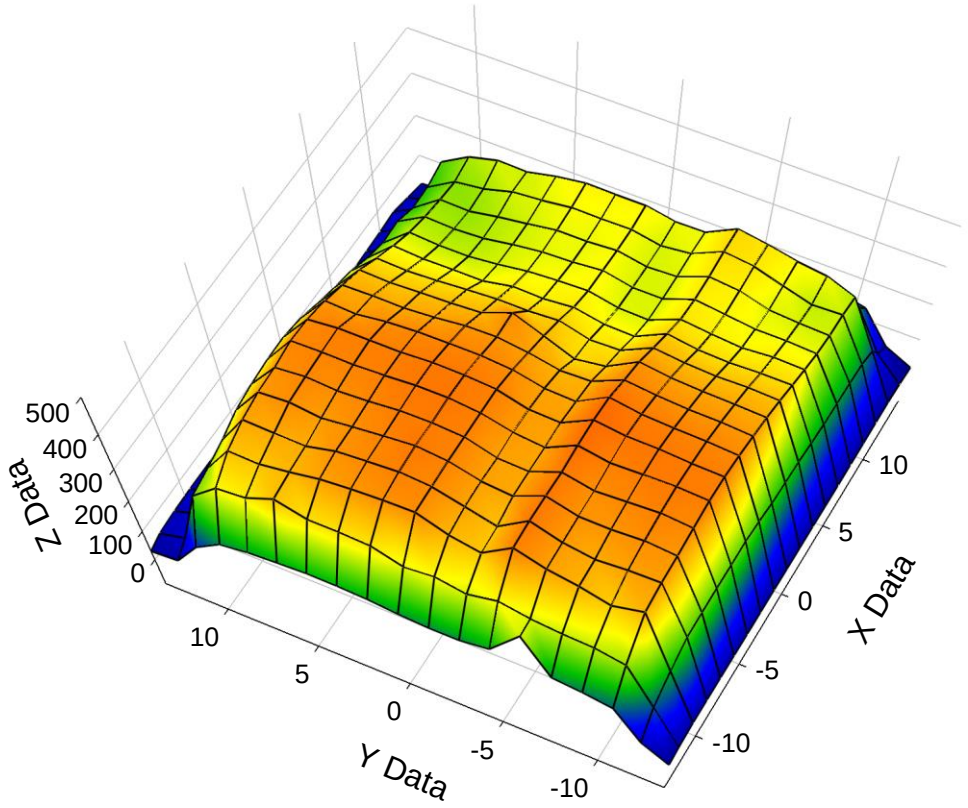


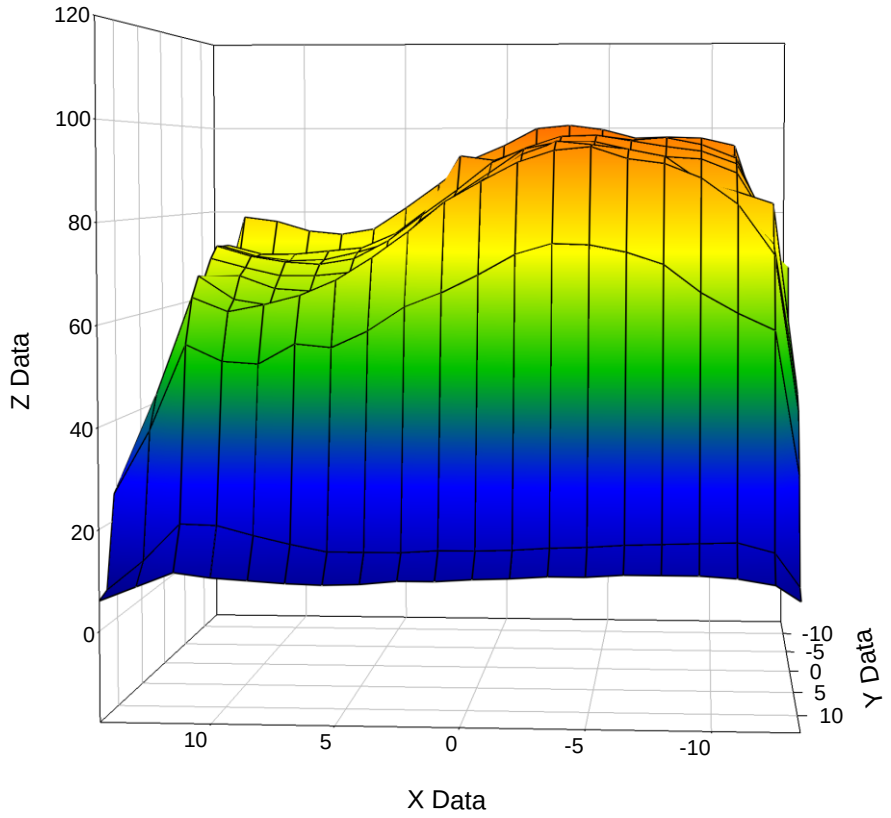




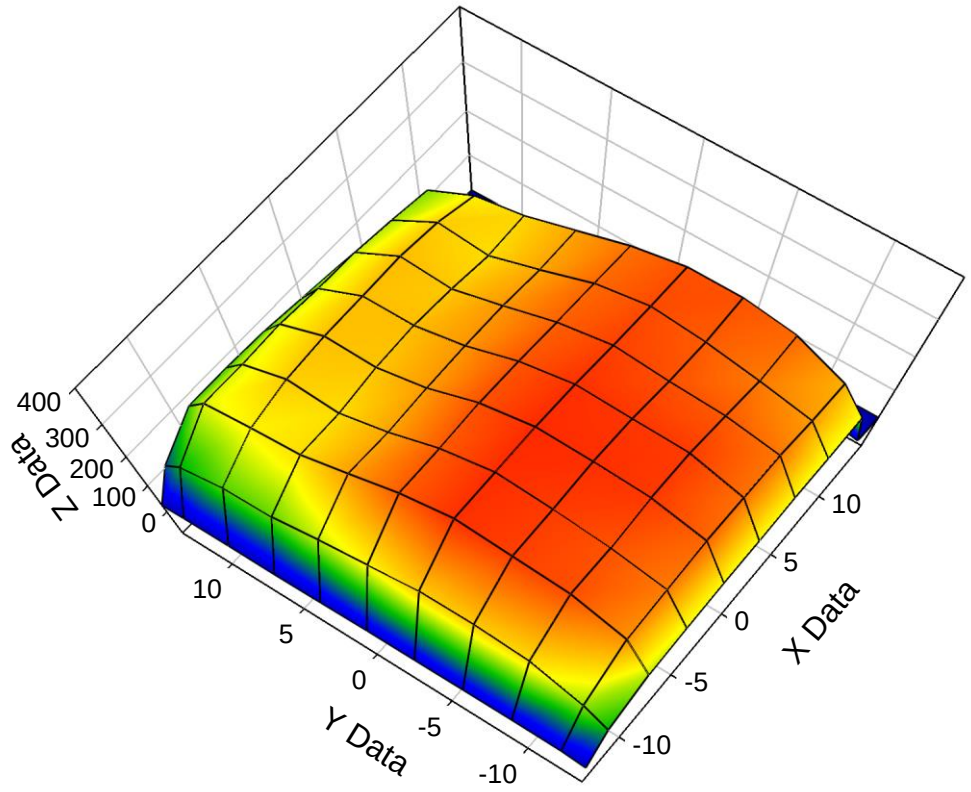
Response map of tower 2 light guide + 4 sipms on EMCal 1x8 preamp board
Measured amplitude (analog sum of 4 sipms) vs X-Y position (mm)

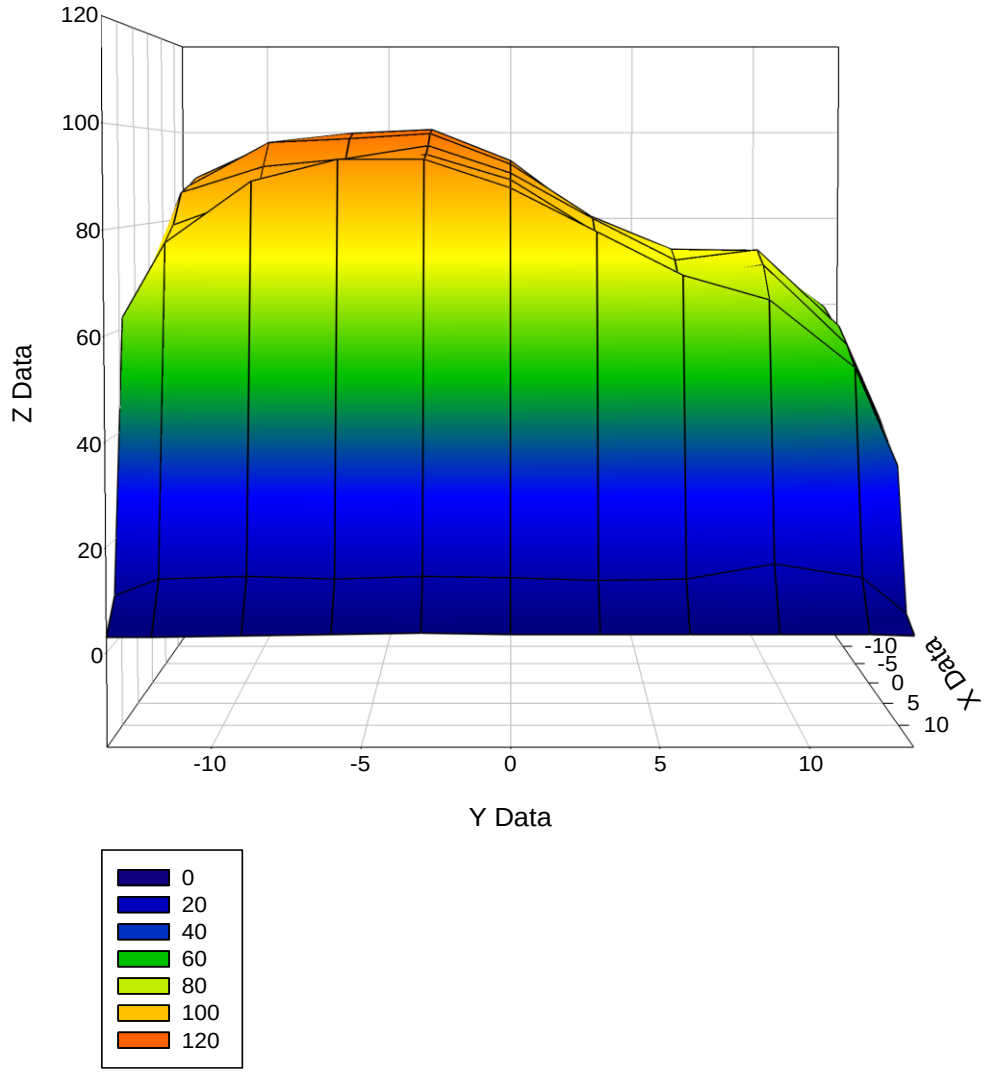






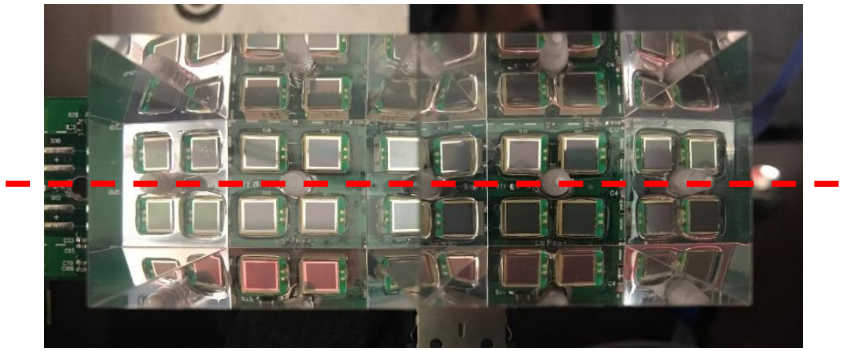
Channel 2 light guide, rotated 90 deg in measurement setup

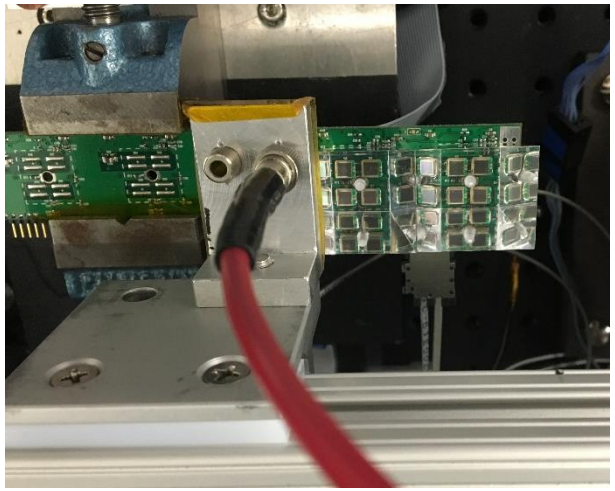


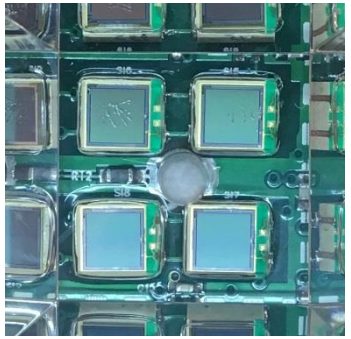


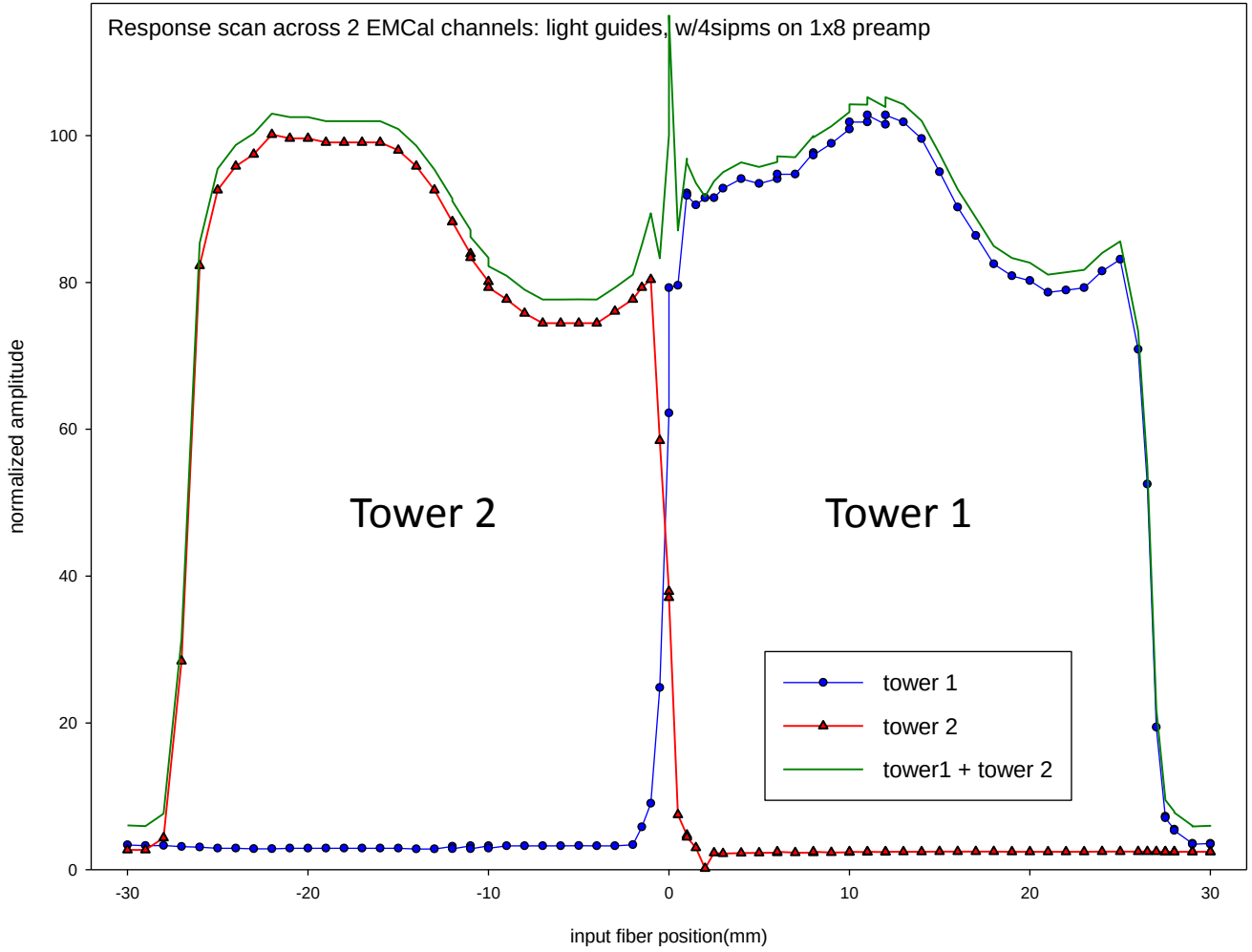
Response pattern followed light guide when rotated
In test setup.

Scan along central axis of 2 light guides, along 1x8 preamp board axis to characterize gap between LG's. 420nm LED / 0.6mm diam fiber ~ 0.5mm from LG surface

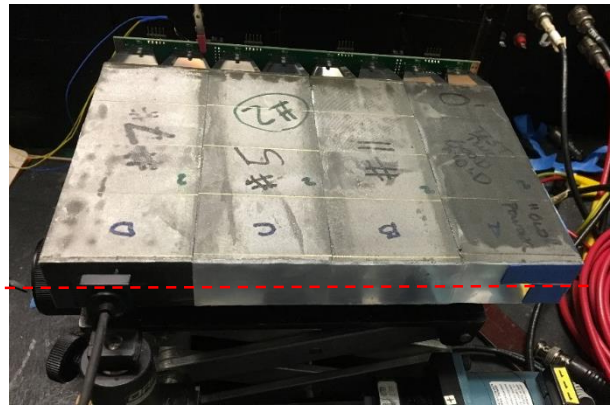


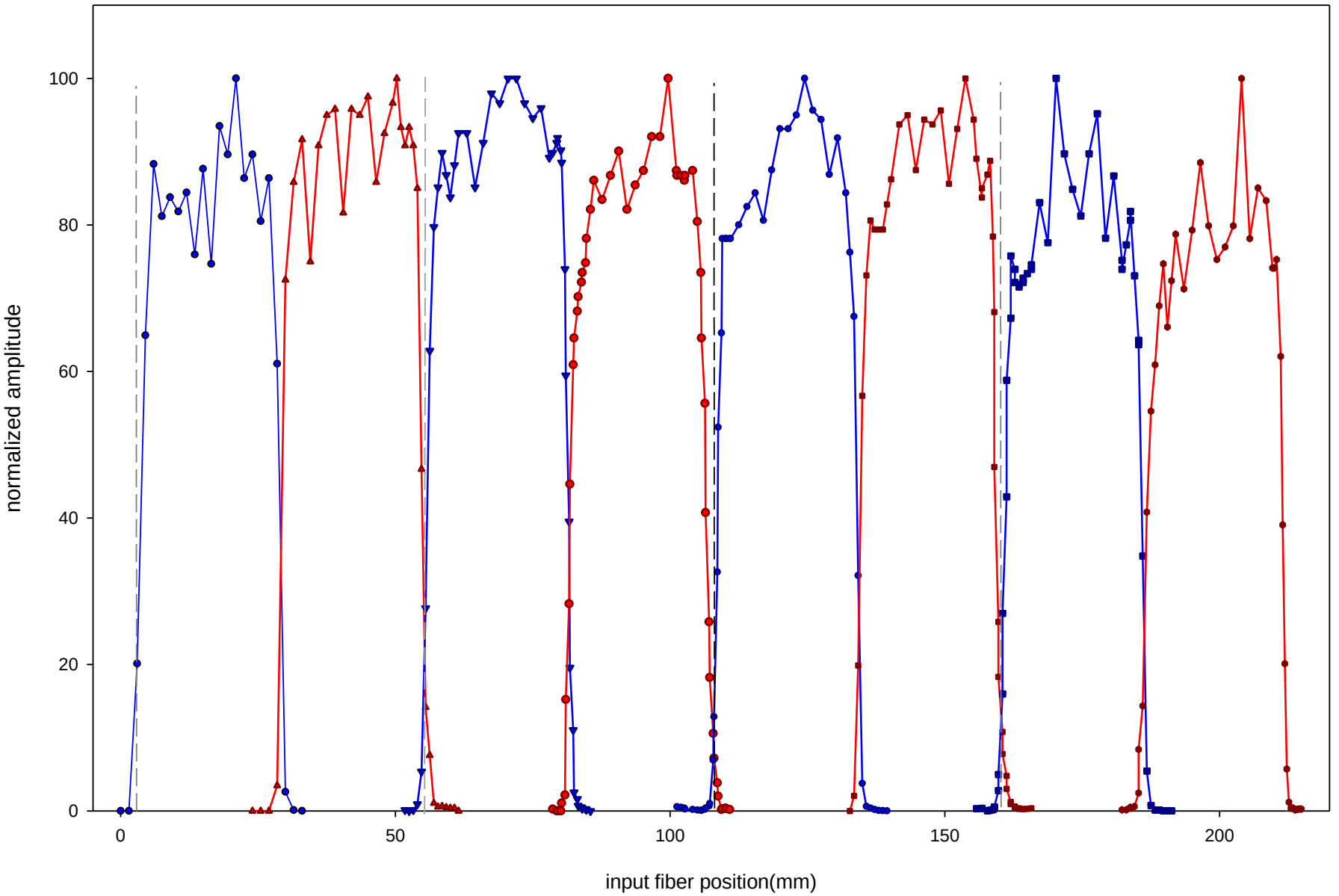






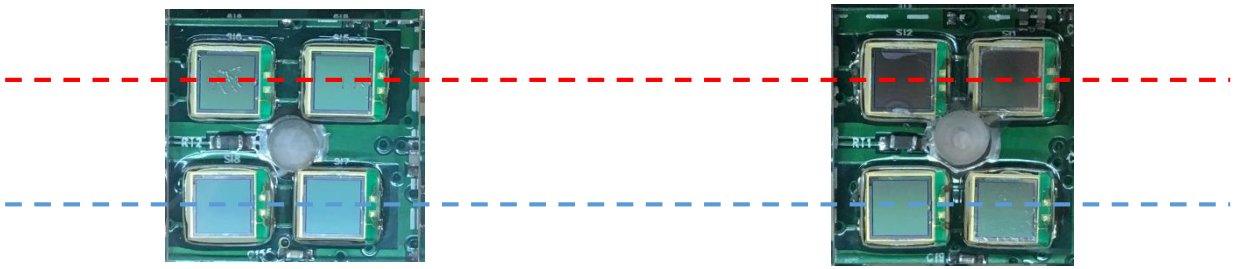
Response scan across centerline of EMCal blocks ("row 8"): w/light guides and 4 sipms on 1x8 preamp
tower-tower gains not balanced

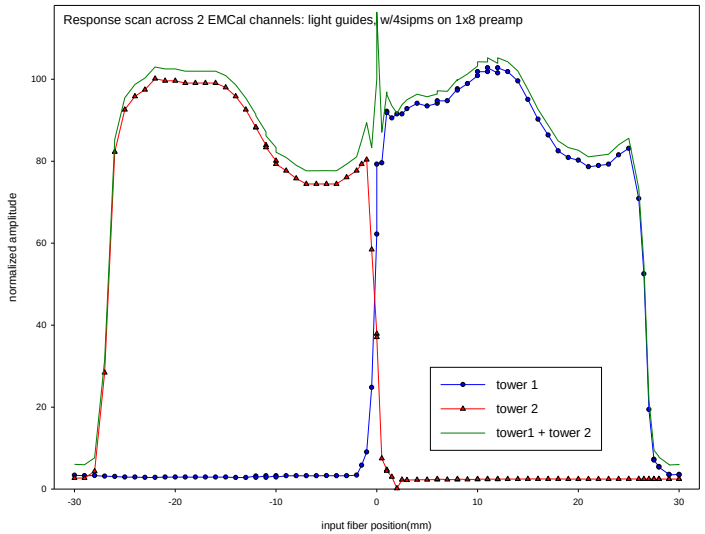


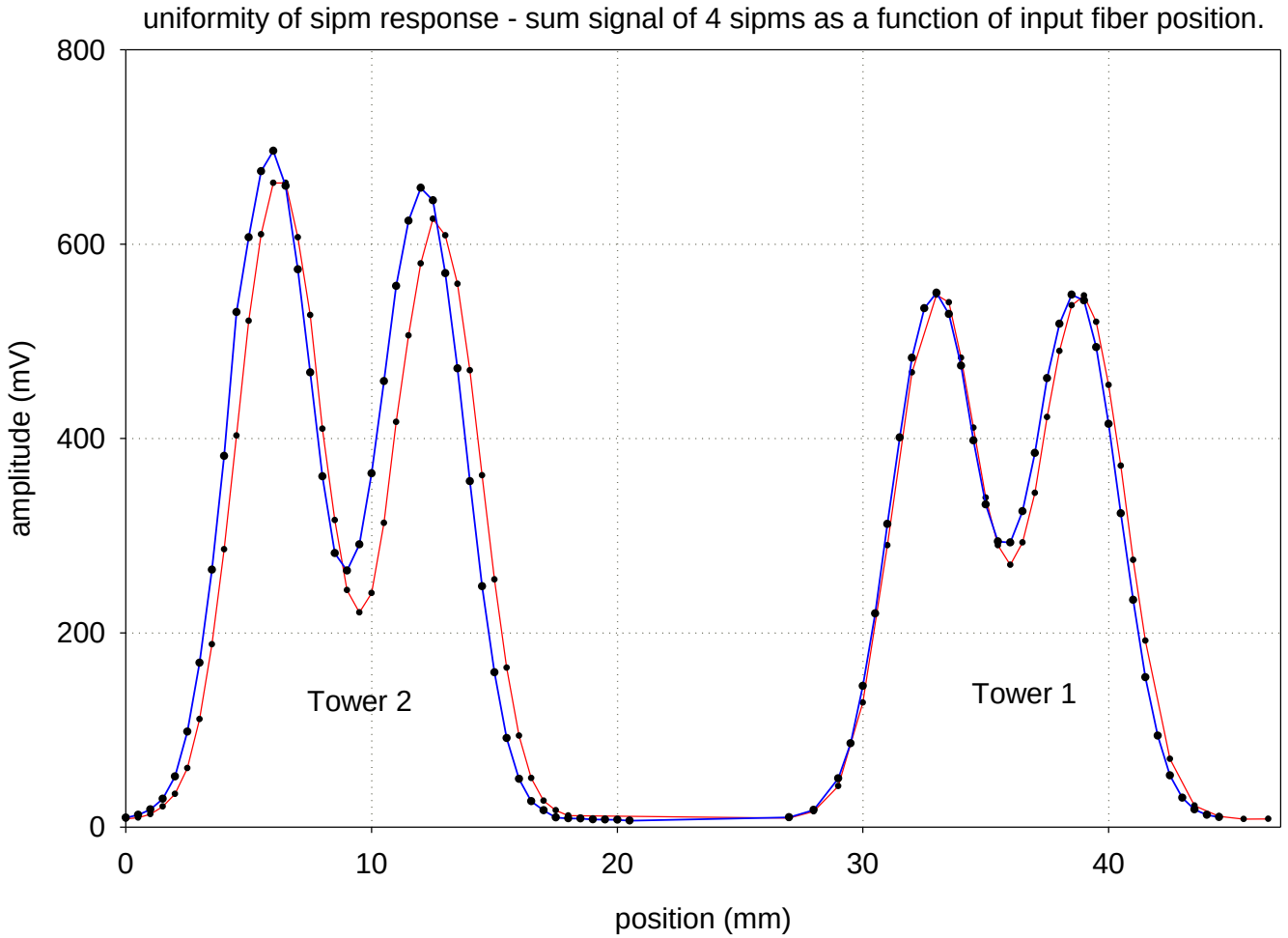


SiPMs on PCB without light guides

Is response non-uniformity due to sipm response or some L-R bias in the pcb?

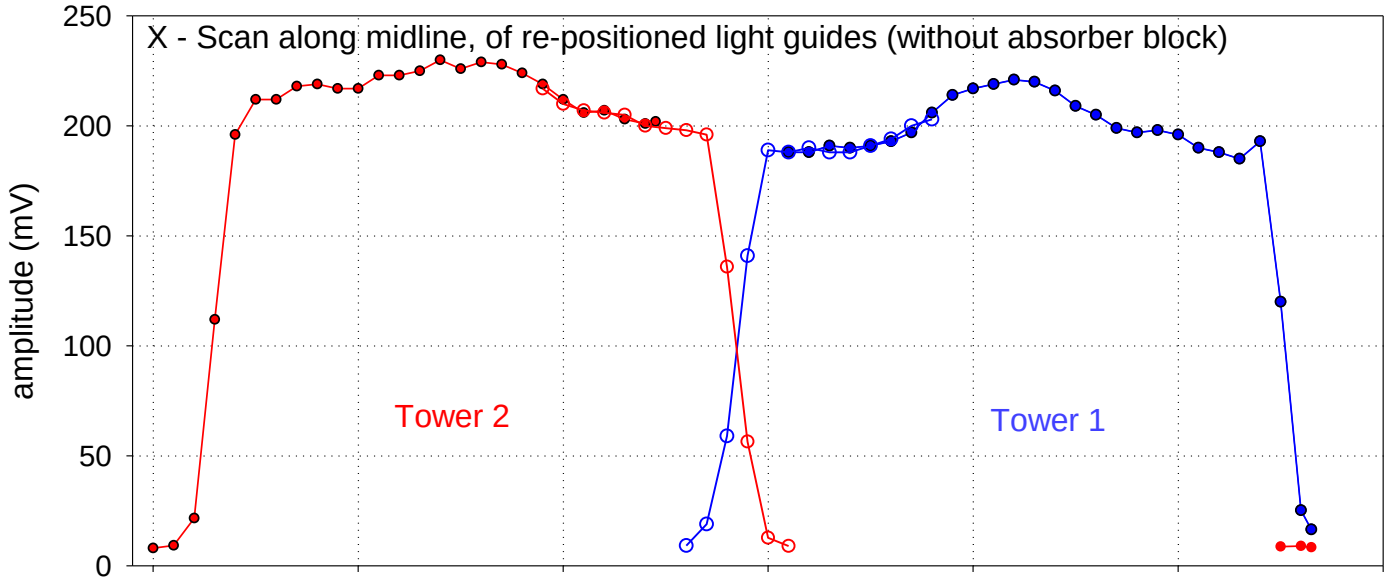


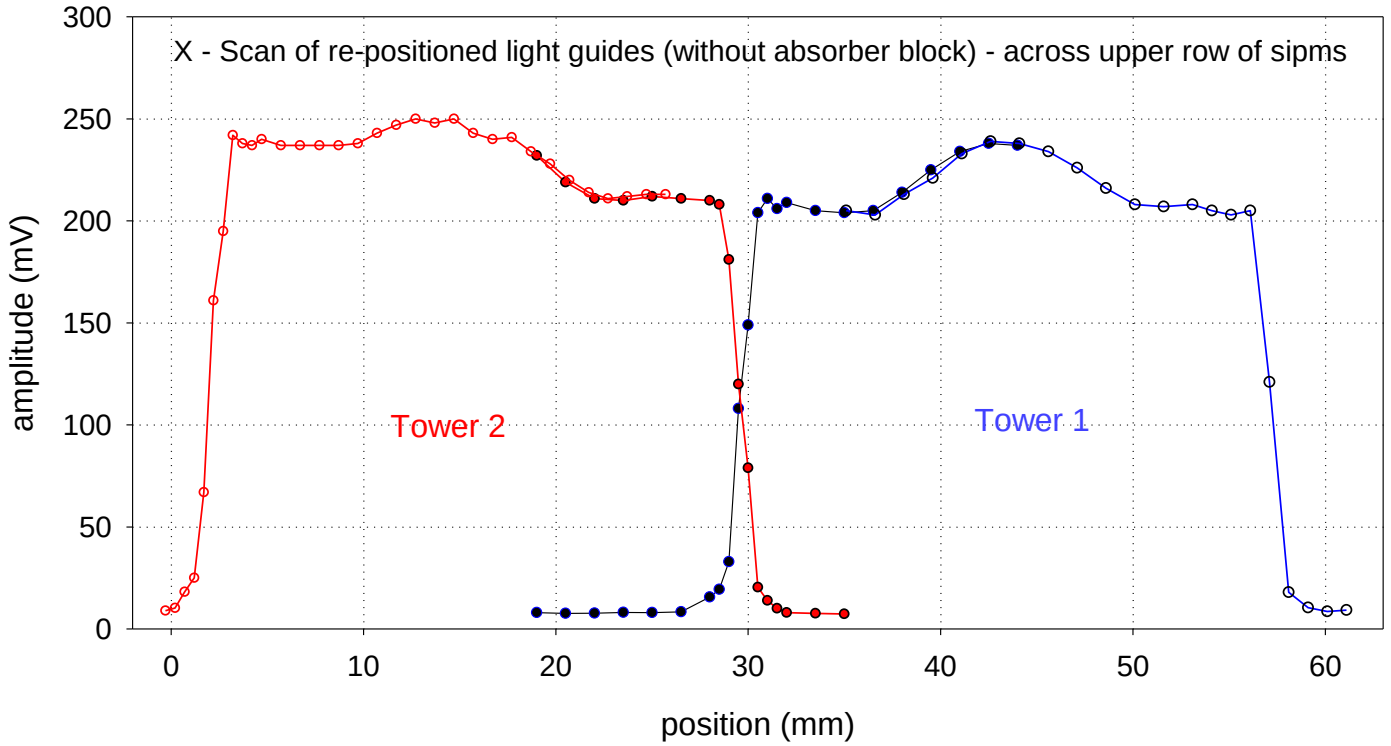




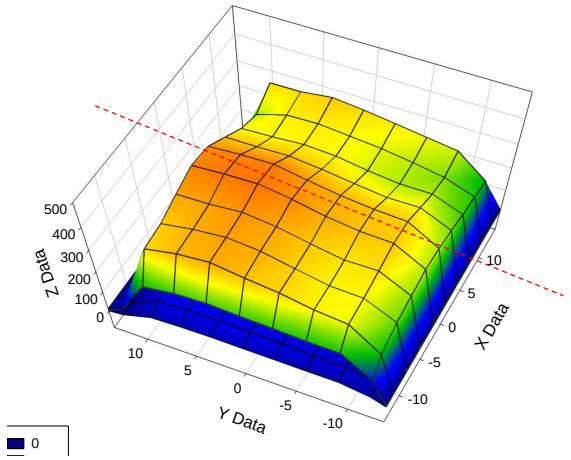
Re-position (and reglue) lightgudes
To better center them on the active areas of the 4 sipms

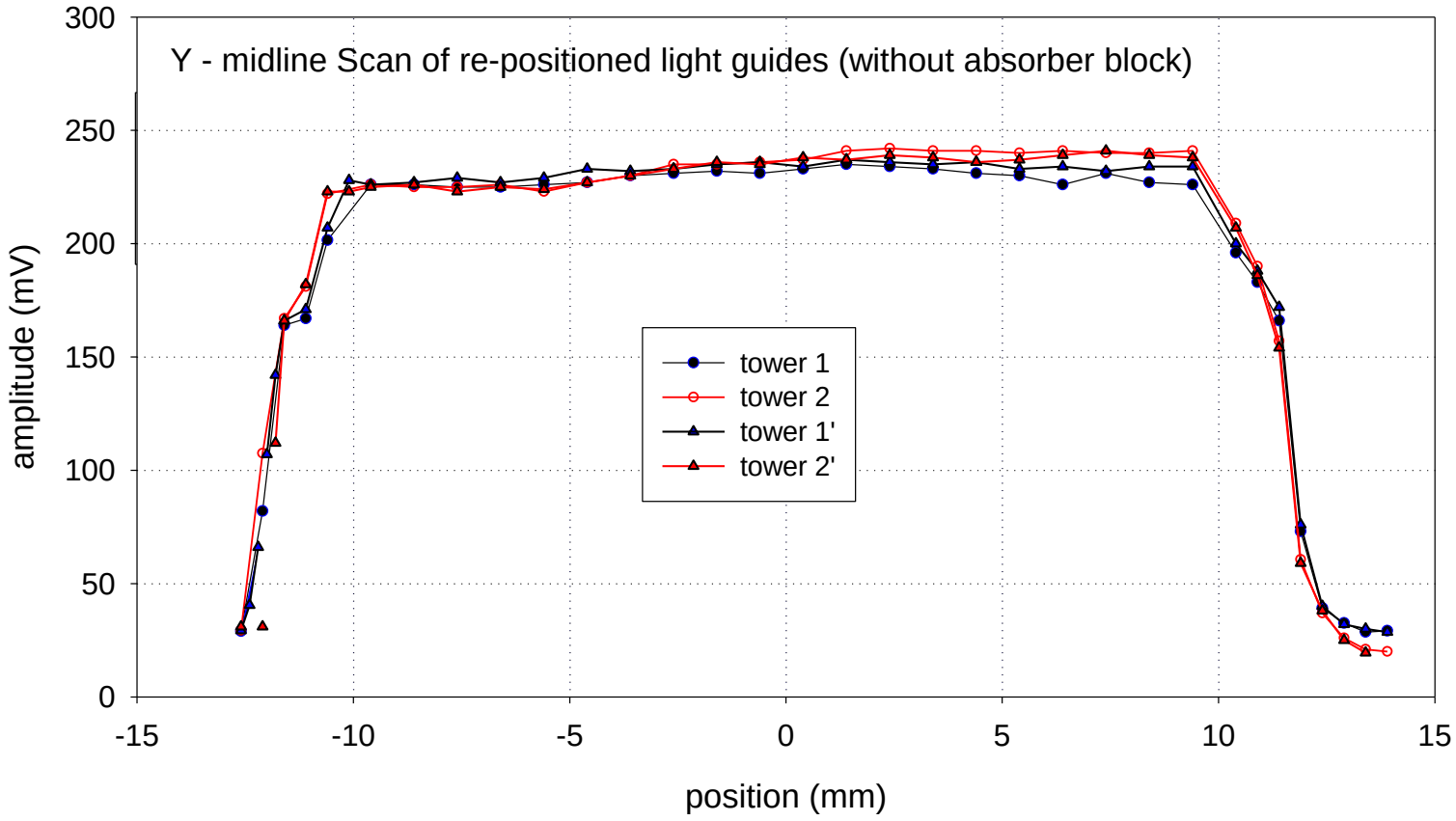
This centers the profile of the non-uniformity, but the amplitude of the variation is +/- 8%



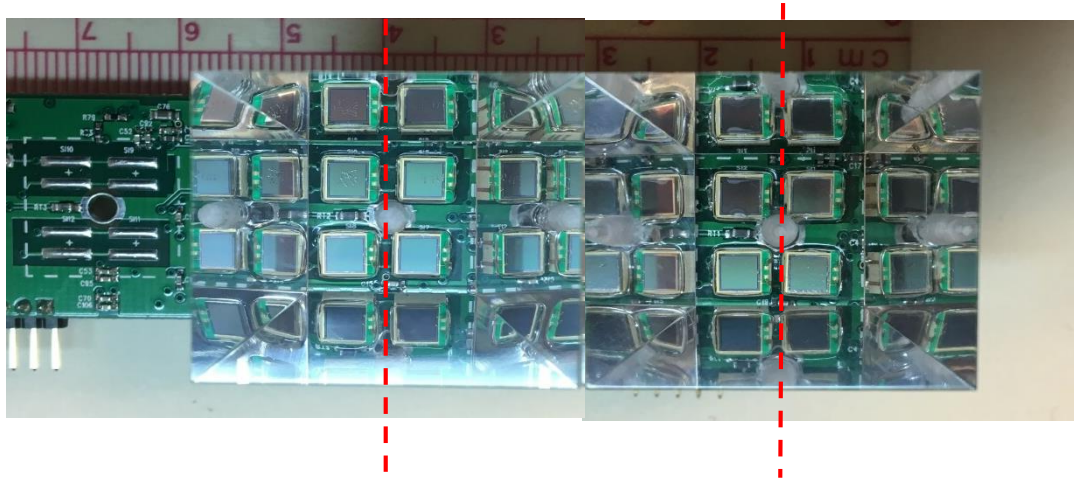


Scan along “Y” axis centerline of Light guides/towers





Tower 2 Tower 1



- Asymmetric response pattern appears to be from the relative positioning of the light guides on the sipms.
- When the light guide is centered, the profile is more symmetric, but still has non-uniform drop-off around the edges – non-uniformity ~ +/- 8%.

- Gap between light guides does not cause a large drop in response…
- But when light guides are attached to blocks, gaps become visible between towers and more so between blocks (alignment with LG edge and rows of fibers?)
- A scan of the sipms without the absorber or light guides does not suggest any significant non-uniformity due to the sipm grouping or pcb design.

- Measurement method makes edge response look worse – due to fiber projected spot moving off block edge